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Planetary Geology

LUNAR SAMPLES

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OBJECTIVE: To become familiar with the mineralogy and petrology of lunar surface rocks.

METHOD: Familiarization with common rock textures and structure as related to their mode of formation; comparison of terrestrial rocks with lunar samples through the use of thin sections and "pseudo-sections."

The instructor will review the main categories of rocks and processes leading to their formation as illustrated through the *Rock Cycle*. In addition, he will discuss the technique of *thin sections* to analyze rocks.

1. Using both normal and polarized light, examine thin sections A, B, C, and D (common terrestrial rocks) and record your observations on the chart. When you are completed, ask instructor to check your results, then be certain that you can recognize the characteristic textures for igneous (plutonic and volcanic), sedimentary, and metamorphic rocks.

2. Examine pseudo-section 3 and record your observations on the chart. This is a section through a pyroxene crystal (cross polarizers) taken from the rock *suevite* from the Ries Basin, Germany. The deformation *lamellae* (linear structures) resulted from high-pressure shock waves generated by the impact that created the Ries Basin (size of original 0.32 X 0.22 mm).

3. Examine pseudo-section 4 and record your observations on the chart. This is a section of a glass bomb from the Ries Basin, found within suevite. It shows schlieren (yellow flow patterns), bubbles (round, white areas) and mineral fragments (white, angular material). (Size of original 0.79 X 0.55 mm.)

Explain how this material could form during impact:

4. Examine photographs AS 11-45-6707 and AS 11-45-6708 through the stereoviewer. These were taken by the Apollo 11 astronauts of the lunar surface; each photo covers an area a few centimeters square. Describe the physical character of the lunar surface:

Where did the fragmental material come from?

The shiny material coating the rock fragments is glass. Where did it come from?

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Explain the origin of the irregular vesicles in the rocks in the bottom of photographs AS 11-45-6708.

5. Examine lunar sample pseudo-sections 122, 125, and 126. The round objects were recovered from the lunar "fines," or soil; they are commonly 1.0 mm or less in diameter. The lack of internal structure (crystal form) identifies them as glass objects. Why do they have a rounded shape; how might they have formed?

Notice the small pock-marks on slide 122. What might they be?

6. Examine pseudo-section 135 (crossed polarizers) and note your observations on the chart. Size of original 0.97 X 0.64 mm. It is a thin section of lunar material and contains feldspar (plagioclase) pyroxene.

It most closely matches terrestrial rock _____.

7. Examine pseudo-section 142 (crossed polarizers) and note your observations on the chart. Size of original 0.09 X 0.06 mm. It is a thin section of lunar material.

It most closely matches terrestrial rock _____.

8. Examine pseudo-section 123 (original 0.38 X 0.25 mm), section 141 (original 2.9 X 1.9 mm), and strew slide 121, all of lunar material. Describe sections 123 and 141 and record your observations on the chart.

Do you see a possible genetic relation between 123, 141 and 121? Explain.

How might the rock of sections 141 and 123 have formed?

9. From your examination of this material, give a summary of the rock types found on the lunar surface and the geologic processes that led to their formation.

Thin Section Analysis.
Fill in as much of the chart as you can. Some of the information you will not be able to determine. Sketches should show grain-to-grain relations, gross texture, and characteristic structure, if any.

Slide no.	Sketch	Texture (clastic, crystalline, etc.)	Structure (lineations, etc.)	Origin	Name